United States Environmental Protection Agency | Air and Radiation (6202J) | EPA 430-F-97-028 December 2000

HIGH-EFFICIENCY LIGHTING

APPLIANCE/LIGHTING IMPROVEMENT

The U.S. Environmental Protection Agency's **ENERGY STAR® Program** promotes the use of high-efficiency technologies and equipment. ENERGY STAR labeled homes use at least 30% less energy than homes built to meet the national Model Energy Code while maintaining or improving indoor air quality. These fact sheets are designed to help consumers learn more about the energy-efficient improvements to their ENERGY STAR labeled homes.

Lighting accounts for as much as 10 to 15 percent of the energy used in a typical residence. Much of this consumption is unnecessary due to the use of inefficient incandescent bulbs or lights left on in unoccupied rooms or outdoors. Currently available lighting technologies can substantially reduce this energy use without sacrificing comfort or convenience, as shown in Figure 1. Specific lighting upgrades include:

Compact fluorescent lamps (CFLs) instead of incandescent light bulbs. CFLs are an energy efficient alternative to incandescent bulbs most commonly used to light our homes. CFLs use about 66 percent less energy while producing the same amount of illumination as incandescent bulbs. In addition, CFLs last about 10 times longer for added convenience. Dedicated fixtures, the type which use plug-in CFLs, are more cost effective and ideally suited for outdoor lighting, kitchens, hallways, and other applications where lights are used several hours each day.

High-efficiency fluorescent fixtures. High-efficiency fluorescent fixtures with T8 (1" diameter) lamps and electronic ballasts use 20 percent to 30 percent less energy than standard T12 ($1^1/_2$" diameter) lamps and magnetic ballasts. Excellent applications include kitchens, laundry rooms, basements, and garages.

Automatic controls for outdoor lighting. Outdoor lighting is used on a nightly basis by many homeowners for safety, security, and aesthetic reasons. Outdoor lighting with automatic controls, such as motion and photo sensors, provide the same function while reducing energy use by as much as 90 percent. Motion sensors instantly turn lights on when motion is detected and off when there is no activity for a desired period of time. Photo sensors measure the amount of daylight present and turn the lights on or off accordingly.

Automatic controls for indoor lighting. Sometimes lights are left on for hours in unoccupied rooms, resulting in needless additional energy expense. Occupancy sensors detect activity within a certain area and switch lights off if no activity is detected. There are two types of occupancy sensors: ultrasonic and infrared. Ultrasonic sensors detect sound while infrared sensors detect heat and motion.

FIGURE 1: HIGH-EFFICIENCY LIGHTING APPLICATIONS

High-Efficiency Lighting	Residential Application	Replacement for	Energy Savings	Other Benefits
Dedicated compact fluorescent fixtures (recessed, hanging, surface mounted)	Kitchens, bathrooms, hallways, living rooms, and outdoor lighting	40 watt to 100 watt incandescent light bulbs	66% to 75% per incandescent light bulb replaced	Fewer bulb replacements and less heat waste
High-efficiency fluorescent lamps with electronic ballast	Kitchens, laundry rooms, basements, and garages	Standard 34 watt to 40 watt fluorescent lamps with magnetic ballasts	20% to 30% per lamp and magnetic ballast replaced	Higher color rendition and less noise
Automatic controls – motion & photo sensors	Outdoor lighting	Manual switches and timers	50% for motion sensors, 20% for photo sensors	Increased safety, security, and convenience
Automatic controls – occupancy sensors	Laundry rooms, children's bathrooms, and playrooms	Manual switches	50% per light bulb replaced	Convenience and fewer replacements

High-Efficiency Lighting

APPLIANCE/LIGHTING IMPROVEMENT

Resources

The Consumer Guide to Home Energy Savings (Wilson and Morrill), 5th edition, 1996, available from the American Council for an Energy Efficient Economy at 510-549-9914

Homemade Money (Heede and the staff of RMI), 1995, available from the Rocky Mountain Institute at 970-927-3851

Lighting fact sheet available from the Energy Efficiency and Renewable Energy Clearinghouse (EREC), P.O. Box 3048, Merrifield, VA 22116, 1-800-DOE-EREC (1-800-363-3732)

The Lighting Pattern Book for Homes is available from the Lighting Research Center at Rensselear Polytechnic Institute, Troy, NY 12180-3590, fax 518-276-2999

Benefits

Installing high-efficiency lighting technologies can provide many benefits including:

Improved comfort. Incandescent light bulbs are more effective at producing heat than light. In fact, 95 percent of the energy consumed is converted to heat. During the summer, this heat increases interior temperatures and adds to the cooling load of a home. Energy efficient lighting technologies produce less waste heat and thus improve comfort in cooling-dominated climates.

Lower utility bills. The average home owner spends approximately $100 per year on lighting. Installing high-efficiency lighting in the most used fixtures (approximately $^1/_3$ of all fixtures) in a home will reduce lighting energy consumption by half. This results in a cost savings of approximately $50 per year, making homes less expensive to operate.

Improved safety and security. Installing energy-efficient technologies on outdoor lighting can improve the safety and security of a home, by providing lighting when needed and deterring criminal activity. Safety also can be improved by avoiding high wattage incandescent light bulbs that can be a fire hazard. Energy-efficient lamps can provide the same amount of light using a fraction of the wattage.

More convenient. Fluorescent and compact fluorescent lamps have lives that are at least 10 times longer than incandescent light bulbs. This results in fewer annoying “burn outs” and subsequent lamp replacements. This is beneficial in hard to reach places such as stairwells and rooms with high ceilings.

Occupancy sensors can also be much more convenient by avoiding the need to manually flip a switch. This is particularly beneficial in laundry rooms where the occupant is likely to walk in carrying a basket of clothes or in children’s bedrooms and bathrooms where it is inconvenient to check if the lights are turned off.

Improved quality. In recent years, there have been many technological advances in fluorescent lighting. Rare earth phosphors have improved the color quality while high-frequency electronic ballasts have eliminated any annoying flicker and noisy hum. Due to these improvements, fluorescent lamps are essentially equivalent to incandescent light bulbs for color quality and instant start.

Increased resale value. High-efficiency lighting can provide the many impressive benefits listed above resulting in a more comfortable and convenient home which is safer and more secure and has lower utility bills. This can translate into higher resale value.